

This fact sheet answers the most frequently asked health questions (FAQs) about chlorine dioxide and chlorite. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Chlorine dioxide is a gas that does not occur naturally in the environment. It is used to disinfect drinking water and make it safe to drink. Chlorite is formed when chlorine dioxide reacts with water. High levels of chlorine dioxide can be irritating to the nose, eyes, throat, and lungs. Chlorine dioxide and chlorite have not been found in any of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are chlorine dioxide and chlorite?

Chlorine dioxide is a yellow to reddish-yellow manufactured gas. It does not occur naturally in the environment. Chlorine dioxide is used as a bleach at paper manufacturing plants, and in public water treatment facilities to make water safe to drink. About 5% of the water treatment facilities serving more than 100,000 people in the United States use chlorine dioxide to treat drinking water.

In 2001, chlorine dioxide was used to decontaminate a number of public buildings following the release of anthrax spores in the United States.

When it reacts in water, chlorine dioxide forms chlorite ion, a compound which is also very reactive. Chlorite ions in water combine with metal ions to form soluble salts, like sodium chlorite.

What happens to chlorine dioxide and chlorite when they enter the environment?

- Chlorine dioxide is a very reactive compound and will not exist in the environment for long periods of time.
- In air, sunlight will rapidly break down chlorine dioxide into chlorine gas and oxygen.
- In water, chlorine dioxide will quickly form chlorite ions.
- Chlorite ions do not exist in air.

- Chlorite ions in water may move into groundwater, although reaction with soil and sediments may reduce the amount chlorite ions reaching groundwater.
- Neither chlorine dioxide nor chlorite ions build up in the food chain.

How might I be exposed to chlorine dioxide and chlorite?

- Chlorine dioxide is added to drinking water to protect people from harmful bacteria and other microorganisms.
- Most people will be exposed to small amounts chlorine dioxide and chlorite ions by drinking water treated with chlorine dioxide.
- Individuals who are employed at pulp and paper mills, municipal water treatment facilities, and other facilities that use chlorine dioxide as a disinfectant may have high exposures to chlorine dioxide and chlorite (ions or salts).

How can chlorine dioxide and chlorite affect my health?

Both chlorine dioxide and chlorite react quickly in water or moist body tissues. Breathing air containing chlorine dioxide gas may cause nose, throat, and lung irritation. Eating or drinking large amounts of chlorite salts may cause irritation in the mouth, esophagus, or stomach. There is no evidence that chlorine dioxide or chlorite affect reproduction in humans.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

Studies in animals exposed to high amounts of chlorine dioxide or chlorite have shown effects similar to those seen in exposed people.

How likely are chlorine dioxide and chlorite to cause cancer?

There are no studies on cancer in humans exposed to chlorine dioxide or chlorite. Based on inadequate information in humans and in animals, the International Agency for Research on Cancer (IARC) and the EPA have determined that chlorine dioxide and sodium chlorite are not classifiable as to human carcinogenicity.

How can chlorine dioxide and chlorite affect children?

There are no unique exposure pathways for children to chlorine dioxide and chlorite. Children exposed to large amounts of chlorine dioxide or chlorite would be expected to be affected in the same manner as adults.

Studies in rats have shown that exposure of pregnant animals to chlorine dioxide and chlorite or exposure of pups shortly after birth may cause delays in the development of the brain. However, the exposure levels in these studies were much higher than what humans are usually exposed to in the drinking water. There are no reliable studies of effects of chlorine dioxide or chlorite in developing humans.

How can families reduce the risk of exposure to chlorine dioxide and chlorite?

Families that drink water treated with chlorine dioxide may reduce the risk of exposure to chlorine dioxide and chlorite by drinking bottled water that has not been treated with these chemicals.

Is there a medical test to show whether I've been exposed to chlorine dioxide and chlorite?

There are no routine medical tests available to measure chlorine dioxide or chlorite in the body. There is a special test to measure chlorite in tissues, blood, urine, and feces, but the test cannot tell the extent of the exposure or whether harmful effects will occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 1 milligram of chlorite per liter (1 mg/L) of drinking water. The EPA also has set a goal of 0.8 mg/L for both the maximum residual disinfectant level for chlorine dioxide and the maximum contaminant level for chlorite in drinking water treated with chlorine dioxide as a disinfectant.

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 parts of chlorine dioxide per million parts of air (0.1 ppm) in the workplace during an 8-hour shift, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for Chlorine Dioxide and Chlorite (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

